This research was partly funded by The Environmental Institute for Golf.

RESEARCH

Tips for managing ultradwarf bermudagrass greens

With extra care, ultradwarf bermudagrasses can provide a challenging putting surface.

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Ultradwarf bermudagrasses (*Cynodon transvaalensis/dactylon*) were developed to produce denser surfaces, which provide greater ball roll distances, better surface uniformity and more-consistent ball roll than traditional varieties.

Contaminated Tifdwarf greens are now frequently converted to an ultradwarf variety and, in the transition zone, ultradwarfs often replace creeping bentgrass, which typically costs an additional $75,000 to $130,000 annually to maintain (10).

Ultradwarf varieties require more intensive management than Tifdwarf or Tifgreen and, although they produce a superior putting surface, they may be more sensitive to poor management or adverse environmental conditions. Here we discuss the management practices required to develop and maintain ultradwarf bermudagrass golf greens.

Choosing a cultivar

A number of ultradwarf bermudagrass cultivars are currently available. TifEagle was developed at the Coastal Plains Experiment Station in Tifton, Ga. MS Supreme was released by Mississippi State University, and Floradwarf was jointly released by the University of Florida and the University of Hawaii. Champion, Classic Dwarf, Jensen, Jones Dwarf, Mini Verde, Reesegrass and most other ultradwarf bermudagrasses were released by private vendors, and less is known about them.

Do not plant an ultradwarf bermudagrass unless the golf course makes a firm commitment to provide the necessary money, tools and personnel for proper management (Figure 1). For most courses with low to moderate budgets, Tifdwarf bermudagrass, in conjunction with the use of trinexapac-ethyl (Primo) and moderate mowing heights, still provides an acceptable putting surface. During tournaments, double-cutting and rolling help increase Tifdwarf putting speeds.

Photos courtesy of B. McCarty

Figure 1. Ultradwarf bermudagrasses require more intensive management than Tifdwarf or Tifgreen (328) bermudagrasses. Poor spring transition can occur if the course lacks the financial resources and trained personnel to manage the new turfgrasses.

Many parameters need to be considered before choosing a grass. Less aggressively growing cultivars such as TifEagle should be considered if the greens will not be overseeded and/or the course is located in Florida, the Gulf Coast area, Southern California, Hawaii or other more tropical regions, because in these areas, more aggressive cultivars require more maintenance in terms of mat, thatch and grain (Table 1).

For overseeding in the transition zone, one of the more aggressively growing cultivars should be considered, as these cultivars tend to transition better in spring. Currently, Champion is the most laterally aggressively growing cultivar evaluated and would be suited to the upper transition zone, especially when overseeding, but thatch accumulation will eventually be a problem (Table 1). Champion initially accumulates almost 12 times more thatch than Tifdwarf and reaches 0.5-inch thatch depth 28% faster than Tifdwarf.

Ultradwarfs have become more popular than Tifdwarf because they produce more shoots/unit area than Tifdwarf and thus provide a smoother and quicker putting surface. After five years, ultradwarf bermudagrasses had 17%-25% more shoots/unit area than Tifdwarf (Table 1).

For long-term turf quality, however, results were mixed. Compared to Tifdwarf, Champion and Mini Verde had lower turf-quality values after five years, but Floradwarf and TifEagle had higher turf-quality values. Turf quality may be poorer with Champion and Mini Verde because thatch accumulates more quickly and the turf, therefore, becomes more prone to scalping. More-intense maintenance in terms of fertility, vertical mowing, watering, etc., seems necessary to achieve the same high quality in Champion and Mini Verde as in Floradwarf and TifEagle.

Soon after planting, ultradwarf cultivars have nearly nonexistent rhizome weights in comparison to Tifdwarf (Table 1). It is

assumed the ultradwarfs redistribute their energy to lateral shoot growth instead of belowground storage. With fewer rhizomes and shorter roots, ultradwarf bermudagrasses require more-intense maintenance to avoid moisture and nutrient stress, are slower to recover from large-scale surface damage and are potentially more susceptible to damage from low temperatures in winter (Table 1).

Light requirements

- Ultradwarf bermudagrass requires full sunlight year-round.
- Eight hours of full sunlight is the minimum for maintaining a healthy bermudagrass putting green (2).
- Afternoon sun appears to be more important than morning sun for bermudagrass greens.
- Trees located to the south and southwest of greens in the Northern Hemisphere may cause shade problems in fall and winter even though they do not in summer.

Thatch and mat

Thatch prevention should begin three to four weeks after planting a new ultradwarf bermudagrass green, with an emphasis on prevention rather than control (7). Biomass of ultradwarf bermudagrass greens must be managed differently from that of Tifdwarf because injuries from aggressive vertical mowing shock ultradwarf cultivars, slowing growth and possibly increasing the chance for decline.

Topdressing

- Light topdressing (for example, 1.0-1.5 cubic feet/1,000 square feet [0.03-0.043 cubic meters/100 square meters]) every 7 to 14 days dilutes the accumulation of organic matter, improves air-filled porosity and produces a firm surface without inconveniencing golfers.
- A brief irrigation cycle or hand brushing after topdressing is needed to incorporate this light sand topdressing into the canopy.
- Topdressing material should be fine enough (for example, 0.25-0.75 millimeters in diameter) to filter into the turf canopy but not so coarse (for example, larger than 0.75 millimeters) that it is removed during the next mowing.
- The stolons of actively growing bermudagrass lie flat, and the growing point escapes the mower bedknife, causing thatch and grain (Figure 2).
- Vertical mowing, grooming and brushing help to overcome or reduce this horizontal stolon growth.

Brushing

- Brushing improves the putting quality of ultradwarf greens and helps reduce grain development.

ULTRADWARFS VS. TIFDWARF

Variety	Thatch accumulation			Increased shoots/unit area		Turf quality	Rhizome weights	Root length	Freeze tolerance
	After 5 months	After 5 years*	Time to 0.5-in. depth	After 5 months	After 5 years*	After 5 years*	After 5 months	After 60 days	
Champion	11.7 times more	28% less	28% faster	100%	21%	19% less	98% less	21% less	15% less
FloraDwarf	7.5 times more	22% less	similar	50%	17%	9% better	99% less	7% less	14% less
Mini-Verde	5 times more	3% less	10% faster	100%	25%	25% less	91% less	7% more	6% less
TifEagle	7.7 times more	14% less	10% faster	50%	19%	13% better	90% less	36% less	similar

*Averages are across four fertilization rates.

Table 1. Characteristics of ultradwarf bermudagrasses compared to Tifdwarf bermudagrass (1,6,8,11,13).

- It raises the tips of juvenile stolons to create a smoother, more complete clipping.
- In conjunction with light topdressing, brushing keeps the raised stolons and shoots vertical to produce a more consistent putting surface.
- It is less injurious to the plant than vertical mowing or grooming.
- Brushing is performed daily during periods of active growth.

Vertical mowing

- Preventing excessive thatch buildup is more important than removing it after it has developed.
- Vertical mowing is used sparingly on most ultradwarf greens because ultradwarf greens typically require about three weeks to recover from a single aggressive vertical mowing (13).
- Vertical mowing may lead to some bermudagrass green decline.
- Vertical mowing should be used to open the turf before overseeding and annually during active growth to reduce organic matter accumulation in the upper profile.
- Heavy aggressive vertical mowing is the only timely way to correct excessive grain where different shades or stripes of grasses are apparent. In these instances, vertical mowing should be perpendicular to the grain pattern to maximize grain removal without excessive turf damage.

Grooming

- Grooming during active growth will reduce lateral stolon growth, but tends to be more intrusive than brushing.
- Use grooming to prevent thatch only during active growth and when clipping yields are high.
- Light grooming to smooth the putting surface provides a cleaner cut and helps to avoid grain development; it appears to do little to prevent thatch buildup.
- Groom at least weekly in summer.
- Grooming blades are typically set to penetrate $\frac{1}{16}$-inch (1.6 millimeters) into the turf leaf canopy. If grooming patterns are still evident after three days, blades are set too deep.

Aerification

- Frequent hollow- and solid-tine aerification opens the soil to the atmosphere, allowing rapid exchange of soil air with ambient air and purging carbon dioxide, hydrogen sulfide and methane.
- Core-aerification followed by backfilling the holes with sand moves the accumulation of organic matter in the upper portion of the profile.
- Aerify 15%-25% of the surface area each year (5) by manipulating the diameter of coring tine used, tine spacing and the number of aerifications.
- At least one annual deep-tine [6-10 inches (15-25 centimeters) deep] core-aerification will help relieve the subsurface soil compaction that naturally develops with greens.

Fertility

- Soil analysis is needed to determine whether pH, nutrients and plant-parasitic nematodes are limiting turfgrass rooting and nutrient uptake.
- Adequate pH levels for bermudagrass greens range from 6.0 to 6.5. Higher pH levels can alter nutrient availability to plants, promote unwanted lateral pesticide movement and encourage certain diseases such as spring dead spot.
- On sand-based greens, soil sampling should be performed twice yearly with additional analysis if turf quality indicates problems (3).
- Tissue analysis is considered the best tool for assessing a fertilizer program, especially for nitrogen and sulfur (see Table 2 for nutrient ranges).

Fertility program

Proper fertilization is essential to sustain playability and to achieve desirable turfgrass color, density, pest and disease resistance.

Nitrogen

Seasonal applications of nitrogen are necessary to maintain turf quality. Excessive nitrogen fertilization accelerates thatch/mat formation and reduces ball roll distance.

- For ultradwarfs, maintain a continuous, low supply of nitrogen rather than infrequent applications at yearly rates of 8-18 pounds nitrogen/1,000 square feet (3.9-8.8 kilograms/100 square meters).
- On sand-based greens, the nitrogen rate is 0.29-0.37 pound/1,000 square feet (0.14-0.18 kilogram/100 square meters) per week in summer (11). Grasses grown on sand-based root zones in areas with heavy rainfall or an extended growing season require the higher nitrogen rate.
- Where growing seasons are shorter, use 8-12 pounds nitrogen/1,000 square feet (3.9-5.9 kilograms nitrogen/100 square meters).
- Excessive nitrogen fertilization in fall can increase thatch buildup, promote succulent

Figure 2. Because of their lateral growth, ultradwarf bermudagrasses tend to develop grain faster and more extensively than traditional turfgrasses. When grain is this severe, heavy verticutting is the best means of eliminating it.

shoot growth and reduce carbohydrate formation in roots, which may lead to damage from low temperatures in winter.

Potassium

- Potassium increases plant tolerance to cold, heat, drought, diseases and wear (10). Monitor potassium level on soil and tissue reports and maintain medium to high levels.
- A 1:1 ratio of nitrogen to potassium fertilizer is typically used; a ratio of up to 1:2 can be used before seasonal stress.
- Calcium and magnesium (important for green color) levels should be checked because their availability depends on their ratio to potassium.

Phosphorus

- Soil phosphorus levels tend not to fluctuate as much as nitrogen or potassium.
- Use routine soil analysis to monitor phosphorus levels. Usually, 1-4 pounds phosphorus/1,000 square feet (0.49-0.20 kilogram/100 square meters) are needed yearly.

Micronutrients

- Perform routine soil and tissue analysis to determine micronutrient deficiencies (Table 2).
- To ensure proper micronutrient availability to plants, maintain a soil pH of 6.0-6.5.

Mowing

- Under optimal growing conditions, ultradwarf bermudagrasses can tolerate mowing heights as low as 0.125 inch (3.2 millimeters) for extended periods and 0.10 inch (2.5 millimeters) for short periods (4). At these mowing heights, the turf maintains acceptable density, but the plant is under considerable stress.
- Extended stress periods, primarily caused by low light intensity, typically occur in mid-August through mid-September and require higher mowing heights and greater leaf area to provide adequate photosynthesis for plant metabolism.
- Mowing height can be raised up to 0.188 inch (4.7 millimeters). Raising the mowing height as much as possible in the autumn will also improve winter survival, especially in the transition zone where winterkill can occur.
- Ultradwarf bermudagrass management requires greater attention to mowing equipment, such as thinner bedknives, more frequent grinding and backlapping, and less margin of error in reel setup.

Plant growth regulators

- Primo (trinexapac-ethyl), the most popular PGR used on bermudagrass, is a foliar-absorbed, Type II PGR that suppresses growth through interference with biosynthesis of gibberellic acid, a hormone responsible for cell elongation.
- Turf leaves must absorb the PGR before significant irrigation or rainfall occurs.
- Applications of Primo improve turf quality and tolerance to low light and increased root length (2).

BERMUDAGRASS NUTRIENT RANGES

Nutrient	Low	Desired	High
		%	
Nitrogen (N)	3.50-3.99	4.00-4.50	>6.00
Phosphorus (P)	0.15-0.24	0.25-0.35	>0.60
Potassium (K)	1.00-1.49	1.50-2.00	>4.00
Calcium (Ca)	0.30-0.49	0.50-0.60	>1.00
Magnesium (Mg)	0.10-0.30	0.30-0.40	>0.40
Sulfur (S)	0.15-0.50	0.50- 0.60	>0.60
		parts per million	
Aluminum (Al)	—	<1,500	—
Boron (B)	4-5	15-20	>30
Copper (Cu)	3-4	10-20	>50
Iron (Fe)	40-49	300-4,000	>400
Manganese (Mn)	16-24	80-100	>300
Zinc (Zn)	15-40	40-80	>250

Table 2. Suggested sufficiency ranges for nutrients from bermudagrass golf green tissue analysis (10).

- Rates and frequency are the superintendent's decision, usually 1-3 ounces/acre (73-220 milliliters/hectare) every one to three weeks (10).

Irrigation and localized dry spots

- Heavy, infrequent irrigation (for example, 0.5 inch [1.3 centimeters] every three to five days in summer) is preferred to frequent, light irrigation (for example, 0.1 inch [0.3 centimeter] daily in summer).
- Ultradwarf cultivars' dense canopy often causes water to run off instead of soaking into the turf.
- Even when managed properly, ultradwarfs tend to develop localized dry spots (9).
- Localized dry spots occur more frequently when greens are allowed to dry substantially between irrigations, but this watering schedule is suggested to produce a high-quality putting surface.
- Managing water infiltration and movement into the root zone to avoid localized dry spots is critical.
- In a sand-based green, *Curvularia* species have been noticed to persist in localized dry spots.
- Heavily hand-water areas that are prone to drying out or have poor water penetration.
- Use penetrating forks or solid-tine aerification on dry spots to facilitate water penetration.
- Treat greens preventively with wetting agents and/or syringing during hot, dry weather. Apply wetting agents following label instructions. Treat an entire green (if budget permits) and, if feasible, continue the program throughout the growing season. Monthly applications are typically required throughout the growing season and are often applied following coring to facilitate their movement into the soil.
- Ultradwarf bermudagrasses should not be allowed to dry excessively in late winter or low temperature damage may occur.

Overseeding

Although overseeding provides winter color, it also contributes to thatch or mat accumulation. Overseeded grass also competes with the bermudagrass for light and nutrients and often encourages *Poa annua* populations.

Because of the dense canopy of ultradwarf bermudagrasses, smaller-seeded plants such as *P. trivialis*, alone or mixed with 10%-20% creeping bentgrass, are the best options for obtaining good seed-to-soil contact during overseeding (10).

Management practices that promote smoother spring transition include:

- Not allowing bermudagrass to dry out
- Using nitrogen fertilizer sparingly (for example, 0.5 pound nitrogen/1,000 square feet [0.25 kilograms nitrogen/100 square meters] every three to four weeks) during winter and early spring, but switching to more aggressive (for example, 0.5 pound nitrogen/1,000 square feet [0.25 kilograms nitrogen/100 square meters] every seven to 10 days) nitrogen fertilization rates once night temperatures consistently stay in the mid-60s F to promote bermudagrass growth and weaken overseeded turf
- Lowering mowing heights after nitrogen fertilization to help reduce shading from the overseeded grass

Because transition problems can occur with overseeded ultradwarf bermudagrasses, painting has become a more popular alternative. Painting typically requires two applications during the winter. However, greens with small surface area, high winter traffic, severe undulations or greens composed of native soils, do not respond as favorably to painting. For these greens, a typical fertilization program is:

- Apply 0.5 pound nitrogen/1,000 square feet (0.25 kilogram nitrogen/100 square meters) every two weeks once bermudagrass growth has started until spring transition is initiated.
- Increase the fertilizer rate to 0.5-1 pound nitrogen/1,000 square feet (0.25-0.49 kilogram nitrogen/100 square meters) each week during transition and decrease mowing height to 0.125 inch (3.2 millimeters). This continues until the transition period is completed.
- A herbicide may be used to hasten transition. Check with your university turf specialist on herbicides, rates and timings because they vary with location.

Tarping

- Tarping or covering of greens with a geotextile or similar cloth has merit for certain greens located in the transition zone because it helps hold soil heat, prevent soil dessication and protects against extreme cold.
- Tarps are typically used on greens that are susceptible to winter injury.
- Susceptible greens are: greens in low, pocketed sites; elevated greens, which tend to dry excessively; and greens with new cul-

Figure 3. Because they grow slowly, ultradwarf bermudagrasses can become infected with leaf spot (see lesions in photo). Normally, this disease is not lethal, and bermudagrass grows out of the symptoms once more favorable weather resumes.

tivars with fewer rhizome and rooting characteristics (Table 1).
- Tarping appears to be most beneficial when temperatures suddenly drop to or below 23 F (-5 C) or when temperatures slowly drop below 18 F (-8 C).
- Tarping should be considered during excessive winds, especially when relative humidity is low or when temperatures are forecasted to remain below freezing for extended periods (10).
- Golfers should be kept off the greens under these conditions.

THE RESEARCH says . . .

- **Courses considering one** of the ultradwarf bermudagrasses should realize ultradwarf maintenance needs are more intense than those of Tifdwarf or Tifgreen (328).
- **Proper management practices** (provide full sunlight to the greens, raise the mowing height under unfavorable weather conditions, prevent thatch, avoid scalping, maintain a proper fertilization program and aerify frequently) will result in healthy turf, reduce disease pressure and provide the desired putting surfaces.

Diseases

Spring dead spot

In the transition zone, spring dead spot appears to be the most devastating disease for ultradwarfs, especially during the first three years or so after establishment, presumably because thatch and/or mat is accumulating rapidly or because the antagonistic organisms that suppress this disease are lacking. During this time, a preventive fungicide is highly recommended on greens. Two or three applications of Rubigan 1AS (fenarimol) can be made to total 12 ounces/1,000 square feet (37 liters/hectare). With two applications, 6 ounces/1,000 square feet (18.5 liters/hectare) are applied 60 days before overseeding or painting and repeated 30 days later. With three applications, the first is made at 4 ounces/1,000 square feet (12.7 liters/hectare) of product 60 days before overseeding; second application 45 days before overseeding; and the third application 30 days before overseeding or painting.

Help from fungicides

During spring transition, certain fungicides often improve turf quality (12).
- Two to three applications of 8 ounces/1,000 square feet (24 kilograms/hectare) of Fore 80WP, Dithane 75DF or others (mancozeb) mixed with 4 ounces of Aliette Signature (fosetyl-Al)/1,000 square feet (12 kilograms/hectare).
- Pigmented formulations of Aliette Signature and mancozeb, individually and in combination, are more effective than non-pigmented formulations during and following spring transition.
- For dollar spot in spring, Chipco 26019 or 26GT Flo (iprodione) or Curalan, Vorlan or Touche (vinclozolin) provide control without inhibiting growth.
- After transition, use Cleary's 3336 and others (thiophanate-methyl) to combat root pathogens, such as bermudagrass decline caused by *Gaeumannomyces graminis;* irrigate after application to introduce thiophanate-methyl into the soil.
- Heritage 50WDG (azoxystrobin) is effective in improving bermudagrass stands with midsummer applications at 0.4 ounce/1,000 square feet (1.2 kilograms/hectare).
- Improper management often precedes bermudagrass decline. Weakened bermudagrass from improper management or late summer cloudy weather often allows *Gaeumannomyces graminis* and *Curvularia* species to become problems.
- Use Daconil formulations and others (mancozeb, chlorothalonil) and Chipco 26019 or 26GT Flo (iprodione) for Helminthosporium (*Bipolaris* species) leaf spot and crown rots (Figure 3) in late summer and early fall
- Using thiophanate-methyl on bermudagrass when leaf blotch (*Bipolaris cynodontis*) is present may make the disease worse.

Acknowledgments

Funding for bermudagrass research at Clemson University provided by The Environmental Institute for Golf, the Carolinas GCSA, Camden (S.C.) Country Club, Lexington (S.C.) Country Club and Forest Lake Club, Columbia, S.C.

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